PATENT SPECIFICATION

799,788

Date of Application and filing Complete Specification March 12, 1956.

No. 7578/56.

Application made in Germany on Feb. 3, 1956.

Complete Specification Published Aug. 13, 1958.

ERRATA

SPECIFICATION No. 799,788

Page 2, line 48, *after* "invention" *insert* "reside"

Page 5, line 6, *after* "indirect" *insert* "or direct"

Page 5, line 74, *for* "particularly" *read* "periodically"

THE PATENT OFFICE,

11*th September*, 1958.

firstly for the preliminary soaking of the washing, is subsequently converted into a hot washing bath by adding soap and supplying heat, and is finally used for rinsing. The water is discharged in most cases by way of a siphon-like overflow.

It has already been proposed to feed the fresh water into a tank, from which it is discharged through a valve. The addition of soap or other chemicals may take place from a separate tank.

Such washing machines are automatically controlled, namely by means of electric time switches or a programme control device, and may comprise double-drum washing machines, which consist of a stationary housing having an inner washing drum rotatably mounted therein.

In a typical prior arrangement, the electric current for regulating the heating of the washing machine hitherto controlled a special control valve, which was operated by a pressure means, such as compressed air or water pressure. This pressure agent had to operate at at least 1 atmosphere, and more usually at 2 atmospheres, to operate a steam diaphragm valve. The heat supply, which was generally effected by direct supply of steam, has hitherto customarily been regulated by means of such diaphragm valves, in order to obtain a gradual opening and closing of the valves.

[*Price 3s. 6d.*]

In practice control by water or steam pressure gives rise to considerable difficulties. If the control pressure is non-existant, or drops during the operation, the steam valve closes and the desired temperature is not attained during the washing phase. A commercial laundry clearly could not tolerate such breakdowns, and must install special plants of a reliable nature for the control means.

It is an object of the invention to remove the disadvantages hereinbefore discussed.

According to the present invention, therefore, automatic temperature control of the washing liquid is effected by varying the fresh water supply to the machine whilst maintaining a constant high temperature heat supply thereto. By the term "high temperature" is intended a temperature not less than that of boiling water.

This eliminates the necessity for a diaphragm control valve operated by a pressure means. For the purpose of heating up the washing liquid, it is only necessary to open a steam valve on the washing machine, for example, by means of a handle which is locked until the hot washing phase is finally completed, whereupon, for example, under the control of an electric time switch or a programme control device, the locking of the opened steam valve is cancelled, thus causing the latter to close. When the hot washing phase has been completed, the steam valve is closed,

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Index at acceptance: —Classes 38(4), R(1B: 36B); and 138(2), A1K.

International Classification: —D06f. G05d.

COMPLETE SPECIFICATION

Improvements in or relating to the Laundering of Textile Articles

I, ERICH SULZMANN, a German National, of 13, Bahnhofstrasse, Bremen-St. Magnus, Germany, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention concerns a method of laundering in through-flow washing machines, and an apparatus for carrying this method into effect.

In so-called through-flow washing machines, fresh water is continuously or intermittently fed into the washing machine, and is used firstly for the preliminary soaking of the washing, is subsequently converted into a hot washing bath by adding soap and supplying heat, and is finally used for rinsing. The water is discharged in most cases by way of a siphon-like overflow.

It has already been proposed to feed the fresh water into a tank, from which it is discharged through a valve. The addition of soap or other chemicals may take place from a separate tank.

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An electrically operated steam valve, which for example, opens and closes abruptly, for regulating the heat supply, would have to be operated by a very powerful magnet, and the electric current thus required could only be supplied via a circuit breaker. Due to the rapid switching frequency, occurring on an average every 10 seconds, such a valve regulation would not remain operational for long, apart from the uneconomic expense thereof. Therefore, water and steam have normally been used hitherto as the pressure means for the diaphragm valves.

In practice control by water or steam pressure gives rise to considerable difficulties. If the control pressure is non-existant, or drops during the operation, the steam valve closes and the desired temperature is not attained during the washing phase. A commercial laundry clearly could not tolerate such breakdowns, and must install special plants of a reliable nature for the control means.

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before or when the rinsing phase commences, and this may be effected by the steam pressure itself or by means of a compression spring.

In a typical laundering method of the prior art, the operation was carried out somewhat as follows in the case of through-flow machines having capacity for 100 kg of washing:—

The machine, which after removing the clean washing from a previous washing cycle, still contains, for example, 200 litres, of rinsing water, is first supplied with fresh water, for example, at 50 litres per minute for about 4 to 5 minutes, in order to effect the preliminary soaking of the new charge of dirty washing. Then heat is supplied, for example, in the form of steam for a period of 10 to 15 minutes or longer, whereby the high temperature for a white wash is maintained constant at about 85° C. The regulation of the temperature with a reduced supply of fresh water, for example, 10 litres per minute, is caused merely by means of automatic control of the steam valve.

In the method proposed by the invention on the other hand, the regulation of the washing temperature is effected under constant and uniform supply of steam after the preliminary soaking, by means of a further supply of fresh water or by control of the fresh water inlet valve. Thus the heat supply is no longer controlled by means of a diaphragm valve, but control is applied to the cold water supply to the machine.

The invention thus consists in that the washing liquid temperature is regulated, with a constant, preferably uniform heat supply, for example, by the introduction of steam into the washing machine, by means of the fresh water supply.

A further novel feature of the invention relates to feeding soap solution directly into the machine for the preliminary soaking, and omitting the step of preliminarily soaking only in water, the soap solution being converted, by supplying heat thereto, into a hot washing liquor, whereby the washing temperature is regulated by means of a subsequent supply of fresh water.

Still further features of the invention in the special manner of carrying out the method and also in the apparatus for regulating the temperature of the washing liquor.

The invention affords a technical advance in that the washing process itself is improved by means of the fresh water control.

In the methods used in the prior art, the water supply was shut off during the period of washing and heating, so that a sufficiently long washing time was attained, and at the same time, the interruption of the water supply retained a high concentration of soap in the washing liquor. Despite this, due to the high level of the bath in the washing machine during the preliminary soaking, some of the soap was lost during the subsequent hot washing phase, because due to the throttling of the fresh water supply, the bath level fell as the bath overflowed, and in fact was discharged quicker than the soap contained therein was used up by the washing process. Thus, it has proved better considerably to slow down or entirely to cut off the water supply directly after the preliminary soaking. The water supply is not necessary, in fact, because the high bath level remaining in the machine from the preliminary soaking is sufficient to distribute the added soap.

Thus, in the method proposed by the invention, the hot washing phase is carried out with the highest possible concentration of soap. When the desired high temperature has been attained, it is necessary, for as much water as possible to be present, and indeed at first for clean soap solution to be available, more soap being required for a longer period for dirtier washing, in order for the dirt to be carried off, and then to change over from washing to rinsing by supplying new water to the machine.

Owing to the periodical addition of fresh water or liquor, an economy in washing liquor is effected. By the addition of soap and the throttling of the water supply, an improved utilisation of the volume of liquor is attained. The water supply may be cut off entirely or almost entirely during the heating up period.

The invention will be described further, by way of example, with references to the accompanying generally diagrammatic drawings, in which:—

Fig. 1 is a sectional elevation of one known-double-drum washing machine wherein is utilised the method proposed by the invention;

Fig. 2 is a representation illustrating the method used hitherto;

Fig. 3 shows diagrammatically the new washing method with the control of the washing temperature by means of the addition of water after heating up the machine;

Fig. 4 shows by way of a diagram an alternative embodiment of the method.

With particular reference firstly to Fig. 1 of the drawings, the washing machine shown therein includes a washing drum 11 mounted to be rotatable about a shaft 12 in known manner, for example, in an outer housing 10. The drive may be effected in any desired manner, but is preferably reversible.

Fresh water is fed to the housing 10 by means of a pipe 13 connected to a valve housing 14. The latter includes an electrically controlled valve 15 governing the flow of the water into a pipe 16. The machine is heated either by introducing steam directly into it through a steam pipe 17, or indirectly by interposing a valve 18.

The liquid in the outer drum 10 is maintained at a higher level than that in the washing drum 11. This is accomplished by the manner in which liquid is supplied to the drum 11, for example said liquid may flow through holes 11*a* in the end faces of the drum 11 during

the rotation thereof. The drum may also be circumferentially perforated in known manner. The liquid level in the drum 11 is kept at the desired lower level by suitably regulating the supply to the housing 10, and by reason of its slow transfer into the inner drum 11. The discharge of the liquid is effected by a siphon-like overflow 10*a*. Soap may be added, for example, through a funnel 27.

The operation of a washing machine according to a typical method of the prior art is shown in Fig. 2, wherein the abscissa *x* indicates the periods over which water and steam are supplied, while the ordinate *y* shows the quantities of water and steam supplied.

The machine usually still contains about 200 litres of rinsing water from a previous washing operation—this is shown shaded in front of the abscissa.

Subsequently, during the period *a*, a preliminary soaking of dirty washing is carried out for five minutes, by supplying cold water at a rate, for example, of 50 litres per minute, at a liquor ratio of 1:8, i.e. 8 kg. of fresh water to each 1 kg. of washing. The temperature of the water is of the order of 10° C. After five minutes—shown by the chain-dotted temperature curve *b*—steam is introduced into the machine at the point *c*, and at a rate of about 4 kg/min. At the same time soap is added at the point c_1, thus shortly after the introduction of steam. The quantity of water added however, is kept low during the introduction of steam until a temperature of 85° has been attained, the quantity of added water being indicated by the line *d*. The addition of water during this phase only amounts to some 10 litres, to which must be added about 3 litres of condensate resulting from condensation of the supplied steam.

After approximately 23 minutes the steam supply is throttled as shown at *e*, by actuating a diaphragm valve, while the water supply, as indicated by *d*, is kept at its low value and, due to periodic shutting-off of the steam, drops by the amount of the momentarily non-existant condensate d_1.

The control of the water temperature *b*, until the expiration of a period of 35 minutes, is then regulated merely by periodically throttling the steam supply. Subsequently, the steam is cut off completely and fresh water is now supplied at *g*, viz. approximately until after the expiration of 52 minutes. The water supply is increased (see *h*), for example, to 50 litres per minute to effect rinsing. For 3 minutes the water supply is throttled to some 10 litres per minute (see *i*) and the rinsing operation thus terminated.

From the chain-dotted line b_1 of the temperature curve *b* it is evident that the washing temperature is regulated by periodically shutting off the steam supply.

The diagram in Fig. 3 shows the method according to the invention. In this case also, approximately 200 litres of rinsing water are still present in the machine from a previous washing operation. Approximately 200 more litres of water are added—shown on the drawing in front of the ordinate *y*—in order to enable the washing process to be commenced.

Now, for example, 50 litres per minute of water are fed in for a period of 5 minutes, as shown by the section *a* of the curve. The water supply is then completely shut off and, as the line *b* shows, steam is supplied. The result is an addition of water *d* of about 2 litres merely through steam condensation.

Because the addition of 10 litres of cold water required in the former washing method shown in Fig. 2 is not necessary in the method shown in Fig. 3, less steam is needed than the method shown in Fig. 2. Less condensate is also produced.

Soap or other chemicals are again added at c_1.

When the highest washing temperature is attained at *e*, with the steam valve constantly open and thus with a constant supply of steam, the washing temperature b_1 is now regulated in that the water supply (which for example, is raised to 50 litres per minute), is periodically increased and subsequently entirely or partly shut off, as shown by the lines 1, 1_1 . . . . in the diagram.

The lines shown in the drawing at 1, 1_1 . . . . , indicate that to the fresh water supply, there must also be added the condensate *d*.

The water supply is then completely shut off, i.e. before the expiration of the 35th minute. The steam supply is likewise cut off at *f*.

On termination of the washing operation, an increased amount of water is again supplied at *g*, for example, 50 litres per minute, and the washing is thereby rinsed, the temperature curve *b* consequently falling. In the 52nd minute the supply of rinsing water (at *h*) may also be terminated.

The manner in which the periodic water supply is controlled is shown in Fig. 1.

A manually or mechanically manipulated lever 20 which may be locked as by means of a notch or a pawl 19, serves to open a heat supply device, for example, the steam valve 18. The valve 18 is subjected to the action of a spring 18*a*.

With a constant steam supply through the pipe 17 to the washing machine 10, 11 the cold water supply valve 15 is actuated electrically for example by means of a magnet 21, whose electric circuit 22, 22*a* is controlled by means of a contact thermometer 23 which governs the temperature of the washing liquid. As soon as the washing liquid temperature, owing to the constant supply of steam, has exceeded the required value, for example, 85° C., the magnet 21 is switched into circuit electrically by the contact thermometer 23, and the valve 15 opened, thus causing fresh water

to enter the machine, whereby the temperature falls.

During the preliminary rinsing or the subsequent rinsing of the washing, it is possible for the valve 15, which is subjected to the action of the spring 15*a* to be independently opened via the circuit 24, 22*a*. This latter circuit may be closed in known manner by an electric time switch or by a cam roller regulating the washing programme.

At the end of the heated phase of the washing operation, the steam supply is cut off electrically releasing the locking notch 19 of the steam valve lever 20, for example, by means of a magnet 25, the electric circuit 26, 26*a* of which may also be subjected to a programme control.

A throttle valve 28 and a pressure gauge 29 may also be incorporated in the main steam pipe 17*a* in front of the valve 18. This renders it possible to vary the steam pressure before entering the supply pipe 17.

An alternative method lying within the scope of the invention is shown in Fig. 4.

In this alternative method, the washing machine again contains about 200 litres of clean rinsing water (not shown in the drawing) from a previous washing operation, as in the case of Figs. 2 and 3. Instead of adding 200 litres of water, as shown hatched in Fig. 2, however, there are added 200 litres of soap solution before the washing operation is commenced and before the washing to be washed is put into the machine. (This soap solution is represented by cross shading in Fig. 4). The washing operation is now commenced, and washing is carried out for a period say, of 5 minutes without any further addition of water or soap solution taking place.

A further addition of soap may be effected at *c*. A second addition of soap, however, is not necessary if the correct amount of soap for the washing operation has already been added in the soap solution introduced in the first instance.

During the period over which steam is supplied, liquid is added only by way of the steam condensate *d*.

Similarly to the method described with reference to Fig. 3, less steam is required to be added for the reasons already given, whereby the steam condensate is also reduced, for example, to 2 litres.

On attaining the required washing temperature at *e*, the liquid temperature is regulated by alternately increasing and then cutting off the water supply, whereby corresponding to the temperature curve b_1 shown in the drawing, the temperature rises and falls, although the steam supply is maintained constant.

Then, similarly to the diagram shown in Fig. 3, the operation is continued, i.e. the water supply is completely cut off at *m*, and the steam supply stopped (interrupted) at *f*. Then a larger quantity of water (for example, 50 litres per minute) is supplied at *g* and the rinsing operation carried out up to *h*.

It is also alternatively within the scope of the invention to commence a washing operation with only a comparatively low fresh water supply, with the simultaneous addition of soap, and to supply heat only after a preliminary period, the liquid temperature being subsequently regulated merely by the further supply of fresh water.

By this means, the highest possible concentration of soap solution is brought into contact with the washing and dilution and rinsing away thereof does not occur until the washing-liquid temperature has been attained. The washing is, so-to-speak, treated from the beginning of the washing operation in a highly concentrated soap solution, for example, by rotating the washing drum, the latter in known manner being provided with washing ribs or vanes.

According to another feature of the invention, however, it is possible after a short preliminary soaking for rinsing off the loose dirt, to introduce a high concentration of soap solution into the washing and to treat the same vigorously for a considerable time with little washing liquor, and to increase the washing effect by supplying heat.

During the preliminary soaking in the period *a*, it is possible to add a preliminary washing agent, for example, a synthetic washing agent. By this means there is also obtained a better washing effect and a particularly favourable loosening of the dirt before the actual hot washing phase, the detached particles of dirt being caused to be carried away before the hot washing phase commences.

The use of the invention results in the shortest washing period with a rapid temperature increase and removal of detached particles of dirt at a high temperature with an increased water supply. By virtue of the periodically throttled and increased water supply and the frequent repetition of this regulation of the water supply, the washing temperature is regulated without it being necessary to throttle the steam supply during the hot washing phase.

According to yet a further feature of the invention the water supply may be periodically interrupted during the rinsing phases viz. during the preliminary rinsing or soaking as well as during rinsing subsequent to washing, i.e. the water may be throttled and subsequently increased during these phases. The rinsing phase is carried out in the machine with a small quantity of water by alternating the quantity of the bath and the water levels. The regulation may in such a case be effected by a washing control device or a time switch by way of the electric connection 24.

It is possible to connect a control or signal lamp into the electric circuit for controlling the steam valve or for moving the operating lever 20 into its "off" position. Instead of

heating by means of steam, it is alternatively possible merely to incorporate one or more heating tubes in the washing machine.

The heating of the washing drum may clearly be effected in any convenient manner apart from indirect steam heating, and, electric, gas or oil heating may be particularly mentioned in this connection.

The water supply valve need not be of the exact construction illustrated in the drawings, but may, for example, comprise a ball discharge valve of a preliminary container, and such ball valve may be operable by means of a magnet. In this case the water may in known manner be fed into the preliminary container by way of a separate chamber containing soap or other chemicals, when the funnel 27 may clearly be omitted.

WHAT I CLAIM IS:—

1. A method of laundering textile articles in a through-flow washing machine, in which fresh water is continuously or intermittently fed into the washing machine, and is used firstly for the preliminary soaking of the washing, is subsequently converted into a hot washing bath by adding soap and supplying heat, and is finally used for rinsing, characterised in that automatic temperature control of the washing liquid, is effected by varying the fresh water supply to said machine whilst maintaining a constant high temperature heat supply thereto.

2. A method as claimed in Claim 1, in which in place of a preliminary soaking phase with fresh water, said soaking is effected by directly feeding a soap solution from the start of the washing operation into the machine, and heat is supplied to convert said soap solution into a hot washing liquor, the temperature of which is regulated by controlling the further supply of fresh water.

3. A method as claimed in Claim 2, characterised in that with a comparatively low fresh water supply and simultaneous addition of soap, heat is supplied only after the elapse of a starting period, and the liquor temperature is subsequently regulated by varying the fresh water supply.

4. A method as claimed in Claim 1, in which, after a short preliminary soaking utilising a high fresh water supply, there is effected a partial or complete interruption of said fresh water supply together with the addition of soap or the like, the supply of heat is then increased to raise the temperature of the washing liquid to a desired peak, the fresh water supply then being opened and subsequently regulated in dependence with the temperature of said liquid, said regulation being effected as by an electrical contact thermometer, and finally rinsing is effected by increasing said water supply.

5. A method as claimed in any of Claims 1 to 4, in which, during the preliminary soaking there is added a preliminary washing agent, for example, a synthetic washing agent.

6. A method as claimed in any of Claims 1 to 5, in which the fresh water supply is periodically increased and then interrupted during the hot washing phase, said increase and interruption being frequently repeated.

7. A method as claimed in any of Claims 1 to 6, in which the fresh water supply is also particularly interrupted and increased during the rinsing phase or during the preliminary soaking respectively, said increase and interruption being effected as by means of an automatic switch.

8. An apparatus for carrying out the method claimed in any of Claims 1 to 7, including means such as a steam valve for interrupting the heat supply from a source of heat, a lockable, manually or mechanically operated lever for opening and closing said heat interrupting means, a valve controlling the supply of fresh water to the washing machine, and electrical means such as electro-magnet adapted, with a constant heat supply to said washing machine, to actuate said water control valve, the circuit of said electrical actuating means incorporating a contact thermometer controlling the washing liquid temperature.

9. An apparatus as claimed in Claim 8, further including electrical means such as an electro-magnet for said lever, said release means effecting interruption of the steam supply after carrying out the washing phase, operation of said release means being dependent upon programme control means.

10. A method of laundering substantially as hereinbefore described and ascertained with reference to and as illustrated in Figs. 3 or 4 of the accompanying drawings.

11. Apparatus for carrying out the method claimed in Claim 10, constructed and arranged substantially as hereinbefore described with reference to and as illustrated in Fig. 1 of the accompanying drawings.

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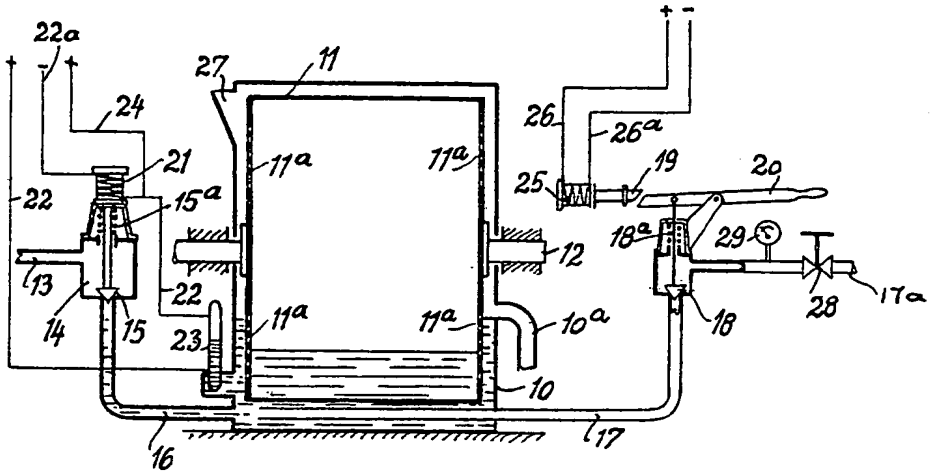
Leamington Spa: Printed for Her Majesty's Stationery Office, by the Courier Press,—1958.
Published at the Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

799,788 COMPLETE SPECIFICATION
2 SHEETS

This drawing is a reproduction of the Original on a reduced scale.
SHEET 1

Fig. 1



799,788 COMPLETE SPECIFICATION
2 SHEETS

This drawing is a reproduction of the Original on a reduced scale.
SHEET 2

Fig. 2

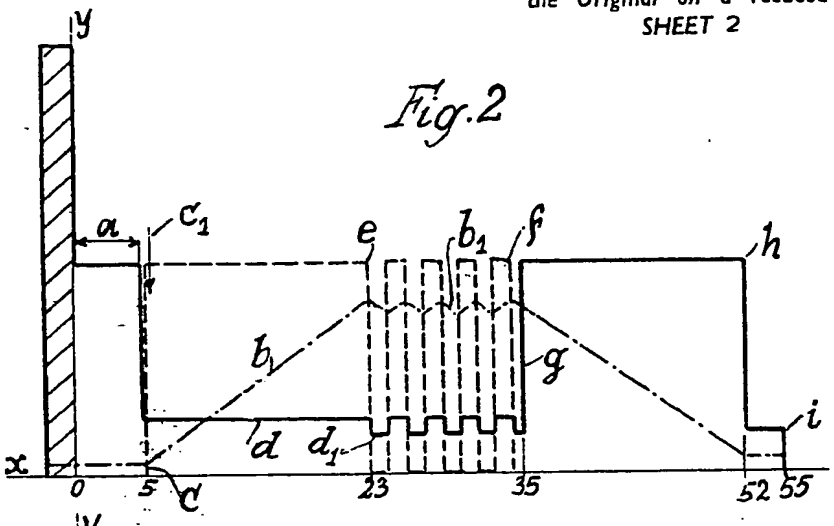


Fig. 3

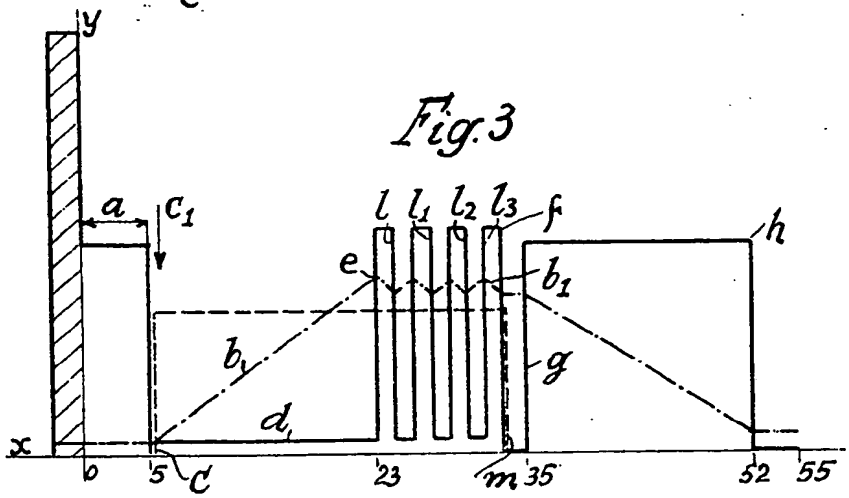


Fig. 4